

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-089446

(43)Date of publication of application : 07.04.1998

(51)Int.Cl.

F16H 57/02

(21)Application number : 09-087728

(71)Applicant : TOYOTA MOTOR CORP

(22)Date of filing : 21.03.1997

(72)Inventor : ADACHI MASATOSHI
IBARAKI TAKATSUGU
HATA YUSHI
SUZUKI HARUHISA
KONDO KOICHI
OSHIMA KEIJIRO

(30)Priority

Priority number : 08215284

Priority date : 26.07.1996

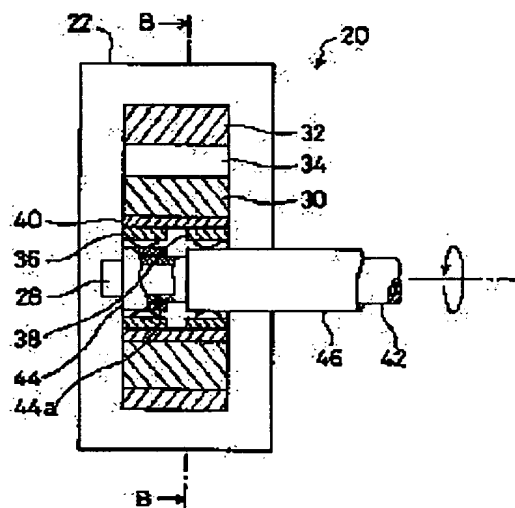
Priority country : JP

(54) HYDRAULIC GENERATOR AND POWER OUTPUT DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To generate hydraulic pressure upon selecting a single one of more than two rotational powers as an input power.

SOLUTION: A hydraulic generator 20 is equipped with a drive gear 30, a driven gear 32 and a crescent 34 constituting a gear pump, and two oneway clutches 36 and 38 attached so as to be engaged at a time when two turning shafts 42 and 46 are rotated each to the drive gear 30 relatively in the same direction, respectively. Accordingly, when these two turning shafts 42 and 46 are rotated in a direction where both are engaged together with each other, the oneway clutch attached to the turning shaft being large in rotational frequency is engaged, driving the drive gear 30. In consequence, the hydraulic generator 20 is able to generate hydraulic pressure by the turning shaft being large in the rotational frequency of these two turning shafts 42 and 46.



LEGAL STATUS

[Date of request for examination]

07.01.1999

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]	3097594
[Date of registration]	11.08.2000
[Number of appeal against examiner's decision of rejection]	
[Date of requesting appeal against examiner's decision of rejection]	
[Date of extinction of right]	

Copyright (C); 1998,2003 Japan Patent Office

*** NOTICES ***

Japan Patent Office is not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.*** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1] An oil pressure generator equipped with a selection means to choose one of the two or more axes of rotation which can input rotational-motion force which is the oil pressure generator which generates oil pressure according to the rotational-motion force in which it is inputted into an input shaft, and is different, and the axes of rotation of these two not less as the aforementioned input shaft.

[Claim 2] The aforementioned selection means is an oil pressure generator according to claim 1 whose rotational frequency of the predetermined direction is a means to choose the largest axis of rotation, between the two or more [above] axes of rotation.

[Claim 3] The aforementioned selection means is an oil pressure generator according to claim 2 which is a means to come to attach in each of the two or more [above] axes of rotation the one-way clutch which does not transmit the rotational-motion force when it is rotation of a direction opposite to this predetermined direction, although the rotational-motion force is transmitted at the time of rotation of the aforementioned predetermined direction to the aforementioned input shaft.

[Claim 4] The prime mover which is the power output unit which outputs power to a driving shaft, and has an output shaft, The 1st motor which has the 1st axis of rotation, and outputs and inputs power to this 1st axis of rotation, The 2nd motor which has the 2nd axis of rotation combined with the aforementioned driving shaft, and outputs and inputs power to this 2nd axis of rotation, When the power which has three shafts respectively combined with the output shaft of the aforementioned prime mover, the 1st axis of rotation of the 1st motor of the above, and the 2nd axis of rotation of the 2nd motor of the above, and is outputted and inputted among these three shafts to any 2 shafts is determined, A 3 shaft type power I/O means by which the power outputted and inputted to one residual shaft based on the determined this power is determined, It is the power output unit which is the axis of rotation which is equipped with the oil pressure generator of a publication 3 either, and is combined with a claim 1, or the axis of rotation by which the two axes of rotation are combined with the output shaft of the aforementioned prime mover and the 2nd axis of rotation of the 2nd motor of the above between the two or more axes of rotation of the aforementioned oil pressure generator.

[Claim 5] The aforementioned oil pressure generator is a power output unit according to claim 4 which it comes to support as the 2nd motor of the above, and one.

[Claim 6] The power output unit according to claim 4 or 5 which comes to prepare the gap which can absorb backlash between the axes of rotation and these output shafts which are combined with the aforementioned output shaft of the aforementioned oil pressure generator.

[Claim 7] There is no claim 4 which comes to prepare the gap which can absorb backlash between the axis of rotation and this 2nd axis of rotation which are combined with the 2nd axis of rotation of the above of the aforementioned oil pressure generator, and it is the power output unit of a publication 6 either.

[Translation done.]

*** NOTICES ***

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.*** shows the word which can not be translated.

3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the power output unit which is equipped with the oil pressure generator and this which generate oil pressure according to the rotational-motion force in which it is inputted into an input shaft in detail about an oil pressure generator and a power output unit, and outputs power to a driving shaft.

[0002]

[Description of the Prior Art] As the former and this kind of an oil pressure generator, it is the oil pressure generator carried in vehicles. For conveyance of oil to a torque converter, the lubrication of the planetary gear unit in transmission, the operation hydraulic pressure supply of the oil pressure control of transmission, etc. It is attached directly [the crankshaft of prime movers (for example, internal combustion engines, such as a gasoline engine and a diesel power plant etc.)] as one component part of transmission, or indirectly. What drives as power a part of rotational-motion force outputted to a crankshaft from a prime mover is proposed. This equipment consists of crescent sash locks 234 pinched like the gear pump 200 illustrated to drawing 11 with casing 220, the drive gear 230 combined with the crankshaft, the driven gear 232 which gears with the drive gear 230 and rotates, and the drive gear 230 and a driven gear 232, and when the drive gear 230 and a driven gear 232 rotate with rotation of a drive shaft, it generates oil pressure. In addition, the inflow path 224 and the outflow path 226 of oil are formed in casing 220.

[0003]

[Problem(s) to be Solved by the Invention] In recent years, from a viewpoint of efficiency use of environmental preservation or an energy resource, a prime mover, a generator, a motor, and a battery are carried and the so-called hybrid type electric vehicle which enables the run by the power outputted, respectively from the run by the power outputted from a prime mover, the run by the power outputted from a motor, and a prime mover and a motor is proposed. When it has gear equipments, such as a change gear, since it is operation of this clutch when connection with the driving shaft combined with the crankshaft and driving wheel of a prime mover is based on gear equipment and connection between the crankshaft of a prime mover and a driving shaft is based on a clutch for the lubrication of this gear equipment and, an oil pressure generator is needed with a such hybrid type electric vehicle for the lubrication of this gear equipment.

[0004] However, although oil pressure can be generated when the above-mentioned gear pump 200 is attached in the crankshaft of a prime mover as an oil pressure generator carried in a such hybrid type electric vehicle, and the prime mover is operated When running with the power outputted from a motor and having stopped operation of a prime mover, since the oil pressure generator did not operate, it could not generate oil pressure, and had the problem that neither operation of a clutch nor the lubrication of gear equipment could be performed. Although there is also the technique of attaching [technique] a gear pump 200 in a driving shaft, and on the other hand generating oil pressure according to the rotational-motion force of a driving shaft, when vehicles have stopped, the problem that oil pressure cannot be generated is produced.

[0005] Although attaching a gear pump 200 in the crankshaft and driving shaft of a prime mover,

respectively is also considered to such a problem, the problem that the number of parts increases and equipment is enlarged since two gear pumps 200 are needed, and the problem that a hydraulic circuit becomes complicated arise.

[0006] These problems are being able to say also about all the driving gears that operate with the power which is not limited to the vehicles carrying a prime mover and a motor, and is outputted from two or more sources of power.

[0007] In addition, an applicant is a hybrid type electric vehicle before equipped with gear equipment, and has proposed the composition (JP,50-30223,A) which attached the hydraulic pump in the crankshaft of a prime mover, and the composition (JP,48-49115,A) which attached the hydraulic pump in the crankshaft of a prime mover, and each of a driving shaft.

[0008] The oil pressure generator and power output unit of this invention solve such a problem, and aim at choosing one of two or more rotational-motion force as input power, and generating oil pressure. Moreover, the power output unit of this invention makes small the input of disturbance, such as vibration of the prime mover to an oil pressure generator, and it sets to consider as equipment with a more high precision to one of the purposes while raising the endurance of equipment.

[0009]

[A The means for solving a technical problem, and its operation and effect] The oil pressure generator of this invention is an oil pressure generator which generates oil pressure according to the rotational-motion force in which it is inputted into an input shaft, and makes it a summary to have a selection means to choose one of the two or more axes of rotation which can input different rotational-motion force, and the axes of rotation of these two not less as the aforementioned input shaft.

[0010] The oil pressure generator of this this invention generates oil pressure according to the rotational-motion force in which it is inputted into an input shaft, by choosing one as an input shaft by the selection means between the two or more axes of rotation which can input different rotational-motion force.

[0011] According to the oil pressure generator of such this invention, since one of the two or more axes of rotation is chosen and it considers as the input shaft of power, oil pressure can be generated with the power outputted from one source of power chosen among the power outputted from two or more sources of power.

[0012] In the oil pressure generator of this this invention, the aforementioned selection means shall be a means by which the rotational frequency of the predetermined direction chooses the largest axis of rotation between the two or more [above] axes of rotation. If it carries out like this, oil pressure can be generated with the power inputted into the biggest axis of rotation of the rotational frequency of the predetermined direction.

[0013] In the oil pressure generator which chooses the biggest axis of rotation of the rotational frequency of such a predetermined direction, the aforementioned selection means shall be a means to come to attach in each of the two or more [above] axes of rotation the one-way clutch which does not transmit the rotational-motion force when it is rotation of a direction opposite to this predetermined direction, although the rotational-motion force is transmitted at the time of rotation of the aforementioned predetermined direction to the aforementioned input shaft. If it carries out like this, simple composition can constitute the oil pressure generator which chooses the biggest axis of rotation of the rotational frequency of the predetermined direction.

[0014] The prime mover which the power output unit of this invention is a power output unit which outputs power to a driving shaft, and has an output shaft, The 1st motor which has the 1st axis of rotation, and outputs and inputs power to this 1st axis of rotation, The 2nd motor which has the 2nd axis of rotation combined with the aforementioned driving shaft, and outputs and inputs power to this 2nd axis of rotation, When the power which has three shafts respectively combined with the output shaft of the aforementioned prime mover, the 1st axis of rotation of the 1st motor of the above, and the 2nd axis of rotation of the 2nd motor of the above, and is outputted and inputted among these three shafts to any 2 shafts is determined, A 3 shaft type power I/O means by which the power outputted and inputted to one residual shaft based on the

determined this power is determined, Having the oil pressure generator of this invention including the above-mentioned modification, the two axes of rotation make it a summary to be the axis of rotation combined with the output shaft of the aforementioned prime mover, and the axis of rotation combined with the 2nd axis of rotation of the 2nd motor of the above between the two or more axes of rotation of the aforementioned oil pressure generator.

[0015] A 3 shaft type power I/O means by which 3 shaft type power I/O means has three shafts respectively combined with the output shaft of a prime mover, the 1st axis of rotation of the 1st motor, and the 2nd axis of rotation of the 2nd motor the power output unit of this this invention When power is outputted and inputted to any 2 shafts of these three shafts, the power determined based on this power outputted and inputted is outputted and inputted from one residual shaft. An oil pressure generator sets the two or more axes of rotation selectable as an input shaft as the axis of rotation combined with the output shaft of a prime mover, and the axis of rotation combined with the 2nd axis of rotation of the 2nd motor, and generates oil pressure with the power outputted from a prime mover, or the power outputted from the 2nd motor.

[0016] According to the power output unit of such this invention, oil pressure can be generated with the power outputted from a prime mover, or the power outputted from the 2nd motor by choosing the axis of rotation combined with the output shaft of a prime mover, and the axis of rotation combined with the 2nd axis of rotation of the 2nd motor.

[0017] In the power output unit of such this invention, it shall come to support the aforementioned oil pressure generator as the 2nd motor of the above, and one. If it carries out like this, since mass becomes the 2nd large, big motor of the damping effect, and the thing of one to an oil pressure generator, disturbance, such as vibration of the prime mover inputted into an oil pressure generator, can be made small. Consequently, while being able to raise the endurance of an oil pressure generator, as a result the endurance of a power output unit, precision of an oil pressure generator, as a result a power output unit can be made high.

[0018] It shall come to prepare the gap which can absorb backlash between the axes of rotation and these output shafts by which such an oil pressure generator is combined with the aforementioned output shaft of the aforementioned oil pressure generator in the power output unit which it comes to support as the 2nd motor and one, or shall come to prepare the gap which can absorb backlash between the axis of rotation and this 2nd axis of rotation which are combined with the 2nd axis of rotation of the above of the aforementioned oil pressure generator. If it carries out like this, even if disturbance, such as vibration which is not expected to the output shaft or the 2nd axis of rotation of a prime mover, arises, the input to the oil pressure generator of disturbance can be made small.

[0019]

[Embodiments of the Invention] Next, the gestalt of operation of this invention is explained based on an example. The cross section in which drawing 1 shows the outline composition of the oil pressure generator 20 as one example of this invention, and drawing 2 are the cross sections showing the B-B cross section of the oil pressure generator 20 of drawing 1 . In addition, drawing 1 serves as a cross section showing the A-A cross section in drawing 2 .

[0020] The casing 22 which is the composition same as the oil pressure generator 20 is shown in drawing 1 and drawing 2 as the gear pump 200 of the conventional example explained using drawing 11 , i.e., the composition as a gear pump The drive gear 30 and the driven gear 32 which gears with the drive gear 30 and rotates, The one-way clutch 36 to which it has the crescent sash lock 34 pinched with the drive gear 30 and a driven gear 32, and also engages with the 1st axis of rotation 42 of a hollow shaft only at the time of rotation of the predetermined direction, Similarly it has the one-way clutch 38 which engages with the 2nd axis of rotation 46 of the hollow shaft which penetrated the shaft center free [rotation] to the 1st axis of rotation 42, and the holddown member 40 which fixes one-way clutches 36 and 38 to the drive gear 30 only at the time of rotation of the predetermined direction.
 [0021] As shown in drawing 2 , the crevice by the side of the lower left of a crescent sash lock 34 and the outflow path 26 of oil open for free passage as well as the crevice by the side of the lower right of a crescent sash lock 34 and the inflow path 24 of oil open for free passage are formed in casing 22 among the crevices between the drive gear 30 and a driven gear 32. This outflow path 26 is connected with

the tap hole 28 formed in the casing 22 shown in drawing 1 , and oil is fed from this tap hole 28 in the inside of the 1st axis of rotation 42.

[0022] the engagement in a circle by which attachment fixation was carried out at the periphery of the 1st axis of rotation 42 when the 1st axis of rotation 42 tended to rotate an one-way clutch 36 in the direction of the arrow in drawing 1 relatively to the drive gear 30 -- it is attached so that it may engage with a member 44 an example -- this engagement -- the member 44 is being fixed to the 1st axis of rotation 42 by lock-pin 44a where some path clearance is prepared between the 1st axis of rotation 42 Therefore, even if the 1st axis of rotation 42 carries out eccentricity by external force, the so-called backlash is absorbed by this path clearance. Moreover, when the 2nd axis of rotation 46 tends to rotate in the direction of the arrow in drawing 1 relatively to the drive gear 30, the one-way clutch 38 is attached so that it may engage with the 2nd axis of rotation 46. Thus, while the 1st axis of rotation 42 and 2nd axis of rotation 46 are rotating [both] in the direction of the arrow in drawing 1 by attaching in the 1st axis of rotation 42 and the 2nd axis of rotation 46, the one-way clutch attached in the axis of rotation with the larger rotational frequency can be engaged, and the drive gear 30 can be rotated. Since the axis of rotation with a smaller rotational frequency serves as an arrow in drawing 1 , and rotation of opposite direction as relative rotation to the drive gear 30 at this time, the state of the one-way clutch attached in this axis of rotation will be in the state where engagement was canceled. Therefore, the drive gear 30 will carry out a rotation drive between the two axes of rotation 42 and 46 by the axis of rotation with the always larger rotational frequency of the direction of the arrow in drawing 1 , and will generate [the oil pressure generator 20] oil pressure by the axis of rotation with this larger rotational frequency.

[0023] According to the oil pressure generator 20 of an example explained above, oil pressure can be generated between the two axes of rotation 42 and 46 by rotation of the axis of rotation with the larger rotational frequency of the predetermined direction. Consequently, oil pressure can be generated, even while one side will not rotate, if either of the two axes of rotation 42 and 46 is rotating in the predetermined direction. And the two axes of rotation can be simply chosen only by doubling the engaged direction and attaching an one-way clutch.

[0024] moreover, the engagement by which according to the oil pressure generator 20 of an example prepares the path clearance of the 1st axis of rotation 42 and a some, and attachment fixation is carried out -- since it is made for a member 44 and an one-way clutch 36 to be engaged, the backlash produced when the 1st axis of rotation 42 carries out eccentricity etc. by external force is absorbable Consequently, the oil pressure generator 20 can be made into that more durable, and it can be made what has a more high precision.

[0025] Although the 1st axis of rotation 42 shall connect the shaft center of the 2nd axis of rotation 46 to the two axes of rotation penetrated free [rotation] in the oil pressure generator 20 of an example, as shown in the oil pressure generator 50 of the modification of drawing 3 , it is good also as what is connected to the two axes of rotation 56 and 58 which extended from the direction which counters through one-way clutches 52 and 54, respectively. In addition, although only the two axes of rotation 56 and 58 and two one-way clutches 52 and 54 were indicated typically and illustration of other composition was omitted in the oil pressure generator 50 of the modification of drawing 3 , about other composition, it is the same as that of the oil pressure generator 20 of an example.

[0026] Although it attached in the oil pressure generator 20 of an example so that two one-way clutches 36 and 38 might be engaged with the two axes of rotation 42 and 46 in the predetermined direction, respectively, it is good for the three or more axes of rotation also as what attaches three or more one-way clutches so that it may be engaged in the predetermined direction, respectively. For example, as shown in the oil pressure generator 60 of the modification of drawing 4 , it is good for the three axes of rotation 72-76 also as what attaches three one-way clutches 62-66 so that it may be engaged in the predetermined direction, respectively. If it carries out like this, oil pressure can be generated by the axis of rotation with the largest rotational frequency of the predetermined direction among the three or more axes of rotation. In addition, only the three axes of rotation 72-76 and three one-way clutches 62-66 were typically indicated like [the oil pressure generator 60 of the modification of drawing 4]

drawing 3 .

[0027] Although considered as the composition which uses one-way clutches 36 and 38 for the two axes of rotation 42 and 46, and is connected to a gear pump (gear pump which consists of the drive gear 30, a driven gear 32, and a crescent sash lock 34) in the oil pressure generator 20 of an example As well as being good also as composition linked to the gear pump which uses one-way clutches 36 and 38 for the two axes of rotation 42 and 46, and is not equipped with a crescent sash lock 34, if oil pressure is generated for the axis of rotation as an input shaft of power, it is good as any composition other than the composition of a gear pump.

[0028] Although the 2nd axis of rotation 46 and one-way clutch 38 shall be engaged directly, you may make it the engagement member of the 1st axis of rotation 42 and an one-way clutch 36 by which prepares some path clearance in the 2nd axis of rotation 46 like engagement, and attachment fixation is carried out, and an one-way clutch 38 engaged in the oil pressure generator 20 of an example. If it carries out like this, the backlash produced in the 2nd axis of rotation 46 can be absorbed, and the oil pressure generator 20 can be made into what [more durable / a thing and what has a more high precision].

[0029] the oil pressure generator 20 of an example — the 1st axis of rotation 42 and engagement — although the member 44 was attached by lock-pin 44a, where some path clearance is prepared, as long as it is fixable, you may attach by what technique

[0030] Next, the power output unit 110 equipped with the oil pressure generator 20 as one example of this invention is explained. Drawing 5 is the block diagram showing the outline composition of the power output unit 110 equipped with the oil pressure generator 20.

[0031] The power output unit 110 consists of oil pressure generators 20 which supply a lubricating oil to the control unit 180 and planetary gear 120 which carry out drive control of the motor MG 2 combined with the starter ring 122 of the motor MG 1 greatly combined with the sun gear 121 of a planetary gear 120 and a planetary gear 120 with which the planetary carrier 124 was mechanically combined with the crankshaft 156 of an engine 150 and an engine 150, and a planetary gear 120, and the motors MG1 and MG2 so that it may illustrate.

[0032] The sun gear 121 combined with the sun gear shaft 125 in the air with which the planetary gear 120 penetrated the shaft center to the crankshaft 156, The starter ring 122 combined with the crankshaft 156 and the starter-ring shaft 126 of the hollow which penetrated the shaft center on the carrier shaft 127 on the same axle, Two or more planetary pinion gears 123 which revolve around the sun while it is arranged between a sun gear 121 and a starter ring 122 and the periphery of a sun gear 121 is rotated, It consists of planetary carriers 124 which are combined with the edge of a crankshaft 156 and support the axis of rotation of each planetary pinion gear 123 to revolve. In this planetary gear 120, the sun gear shaft 125 combined with the sun gear 121, the starter ring 122, and the planetary carrier 124, respectively, the starter-ring shaft 126, and three shafts of a crankshaft 156 are used as the I/O shaft of power, and if the power outputted and inputted among three shafts to any 2 shafts is determined, the power outputted and inputted by one residual shaft will become settled based on the power outputted and inputted biaxial [which was determined].

[0033] The power extraction gear 128 for the ejection of power is combined with the starter ring 122 at the motor MG 1 side. This power extraction gear 128 is connected to the power transfer gear 111 by the chain belt 129, and transfer of power is made between the power extraction gear 128 and the power transfer gear 111. Therefore, the power from the power output unit 110 can be taken out from this power transfer gear 111.

[0034] Both the motor MG 1 and the motor MG 2 are constituted as a synchronous motor generator, and are equipped with Rota 132,142 which has two or more permanent magnets 135,145 in a peripheral face, and the stator 133,143 around which the three phase coil 134,144 which forms rotating magnetic field was wound, respectively. Rota 132 of a motor MG 1 is combined with the sun gear shaft 125 combined with the sun gear 121 of a planetary gear 120, and Rota 142 of a motor MG 2 is combined with the starter-ring shaft 126 combined with the starter ring 122 of a planetary gear 120. Moreover, the resolver 139,149 for detecting the angle of rotation theta1 and theta2 of each Rota 132,142 is formed in each motors MG1 and MG2.

[0035] The oil pressure generator 20 is connected to the carrier shaft 127 and the starter-ring

shaft 126 which were combined with the planetary carrier 124 by the same axle through the two one-way clutches 36 and 38, respectively, and the casing 22 of the oil pressure generator 20 is formed as the case 147 where the stator 143 of a motor MG 2 was attached, and one. In addition, the composition of the oil pressure generator 20 is carrying out the same composition as the oil pressure generator 20 which explained the two axes of rotation 42 and 46 using drawing 1 and drawing 2 except for the point that the point and casing 22 which were replaced with the carrier shaft 127 and the starter-ring shaft 126 are formed as a case 147 and one. Therefore, it omits about explanation of each composition of the oil pressure generator 20 here. Thus, in the power output unit 110, since the oil pressure generator 20 is made into the big mass which vibrates united with a motor MG 1 by forming the casing 22 of the oil pressure generator 20 as a case 147 and one, the damping effect over vibration produced by operating an engine 150 can be enlarged, and the engagement by which prepared some path clearance for engagement to the carrier shaft 127 as an input shaft of an engine 150 and one-way clutch 36 which are the generation source of vibration in the carrier shaft 127, and attachment fixation was carried out -- the shell considered as the composition performed through a member 44 -- Even if backlash arises on the carrier shaft 127 by vibration, disturbance, etc. which an engine 150 does not expect, this backlash can be absorbed and the input to the oil pressure generators 20, such as disturbance, can be made small.

[0036] Although not illustrated about the detail of a control unit 180, a control unit 180 Two inverter circuits which make the false sinusoidal current supplied to the three phase each coil 134,144 of a motor MG 1 and a motor MG 2, The battery which carries out charge and discharge through two inverter circuits, and CPU for motor control which controls switching of two inverter circuits, It has CPU for engine control which controls operation of an engine 150, and operation of a motor MG 1, a motor MG 2, and an engine 150 is controlled based on the signal inputted from the various sensors which detect the state of a motor MG 1, a motor MG 2, and an engine 150. Since it is unnecessary as a gestalt of operation of this invention about the detail of control by this control unit 180, it omits about the explanation.

[0037] Next, operation of the power output unit 110 constituted in this way is explained. When operating an engine 150 on a rotational frequency N_e and the operation point P1 of Torque T_e and operating the starter-ring shaft 126 now on a rotational frequency N_r which is different although it is the same energy as the energy P_e outputted from this engine 150, and the operation point P2 of Torque T_r , the case where carry out torque conversion and the power outputted from an engine 150 is made to act on the starter-ring shaft 126 is considered.

[0038] According to the place which mechanism study teaches, the relation between the rotational frequency in three shafts (the sun gear shaft 125, the starter-ring shaft 126, and planetary carrier 124) of a planetary gear 120 or torque can be expressed as drawing called collinear view illustrated to drawing 6 and drawing 7, and can be solved geometrically. In addition, the rotational frequency of three shafts and the relation of torque to a planetary gear 120 are also analyzable in formula by calculating the energy of each shaft etc., even if it does not use an above-mentioned collinear view. By this example, since explanation is easy, it explains using a collinear view.

[0039] The vertical axis in drawing 6 is a rotational frequency shaft of three shafts, and a horizontal axis expresses the ratio of the position of the axis of coordinates of three shafts. That is, when the axes of coordinates S and R of the sun gear shaft 125 and the starter-ring shaft 126 are taken to ends, the axis of coordinates C of the planetary carrier 124 is defined as a shaft which divides Shaft S and Shaft R interiorly to 1: ρ . ρ is the ratio of the number of teeth of a sun gear 121 to the number of teeth of a starter ring 122 here, and it is expressed with the following formula (1).

[0040]

[Equation 1]

$$\rho = \frac{\text{サンギヤの歯数}}{\text{リングギヤの歯数}} \dots\dots(1)$$

[0041] The rotational frequency N_e of an engine 150 can be plotted on the axis of coordinates C of the planetary carrier 124 with which the crankshaft 156 of an engine 150 is combined since the case where the engine 150 is now operated at the rotational frequency N_e , and the starter-ring shaft 126 is operated at the rotational frequency N_r is considered, and a rotational frequency N_r can be plotted on the axis of coordinates R of the starter-ring shaft 126. If the straight line which passes along both this point is drawn, it can ask for the rotational frequency N_s of the sun gear shaft 125 as a rotational frequency expressed with the intersection of this straight line and axis of coordinates S. Hereafter, this straight line is called collinear of operation. In addition, it can ask for a rotational frequency N_s by the proportion formula (the following formula (2)) using a rotational frequency N_e and a rotational frequency N_r . Thus, in a planetary gear 120, if any two rotations are determined among a sun gear 121, a starter ring 122, and the planetary carrier 124, one residual rotation will be determined based on two determined rotations.

[0042]

[Equation 2]

$$N_s = N_r - (N_r - N_e) \frac{1+\rho}{\rho} \quad \dots\dots(2)$$

[0043] Next, the torque T_e of an engine 150 is made to act on the drawn collinear of operation upwards from drawing Nakashita by making the axis of coordinates C of the planetary carrier 124 into line of action. Since a collinear of operation can be dealt with as the rigid body at the time of making the force as a vector act to torque at this time, the torque T_e made to act on an axis of coordinates C is separable into the torque T_{es} on an axis of coordinates S, and the torque T_{er} on an axis of coordinates R with the technique of separation of the force to the line of action from which the sense is the same as and differs. The size of Torque T_{es} and T_{er} is expressed by the following formula (3) and (4) at this time.

[0044]

[Equation 3]

$$T_{es} = T_e \times \frac{\rho}{1+\rho} \quad \dots\dots(3)$$

$$T_{er} = T_e \times \frac{1}{1+\rho} \quad \dots\dots(4)$$

[0045] What is necessary is just to take balance of the force of a collinear of operation, in order for the collinear of operation to be stable in this state. That is, a size is the same as Torque T_{es} , the torque T_{m1} with the opposite sense is made to act, a size is the same to resultant force with torque and Torque T_{er} with the opposite sense on an axis of coordinates R in the same size as the torque T_r outputted to the starter-ring shaft 126, and the sense makes the opposite torque T_{m2} act on an axis of coordinates S. This torque T_{m1} can act by the motor MG 1, and torque T_{m2} can be made to act by the motor MG 2. Since torque is made to act on direction of rotation and a retrose by the motor MG 1 at this time, a motor MG 1 will operate as a generator and revives electrical energy P_{m1} expressed with the product of torque T_{m1} and a rotational frequency N_s from the sun gear shaft 125. By the motor MG 2, since the direction of torque is the same as direction of rotation, a motor MG 2 operates as a motor and is outputted to the starter-ring shaft 126 by making into power electrical energy P_{m2} expressed by the product of torque T_{m2} and a rotational frequency N_r .

[0046] Here, if electrical energy P_{m1} and electrical energy P_{m2} are made equal, all the power consumed by the motor MG 2 can be revived by the motor MG 1, and it can be provided. What is necessary is for that just to make equal the thing which outputs all the inputted energy then the energy P_e outputted from an engine 150 since it is good, and energy P_r outputted to the starter-ring shaft 126. That is, the energy P_e expressed with the product of Torque T_e and a rotational frequency N_e and energy P_r expressed with the product of Torque T_r and a rotational frequency N_r are made equal. As mentioned above, the power outputted to the starter-ring shaft 126 is transmitted to a driving shaft 112 by the power extraction gear 128 and the power transfer gear 111, and is transmitted to a driving wheel 116,118 through a differential gear 114. Therefore,

since a linear relation is materialized for the power outputted to the starter-ring shaft 126, and the power transmitted to a driving wheel 116,118, the power transmitted to a driving wheel 116,118 is controllable by controlling the power outputted to the starter-ring shaft 126.

[0047] In the collinear view shown in drawing 6, although the rotational frequency N_s of the sun gear shaft 125 is positive, as shown in the collinear view shown in drawing 7, it may serve as negative at the rotational frequency N_e of an engine 150, and the rotational frequency N_r of the starter-ring shaft 126. At this time, by the motor MG 1, since direction of rotation and the direction where torque acts become the same, a motor MG 1 operates as a motor and consumes electrical energy P_{m1} expressed by the product of torque T_{m1} and a rotational frequency N_s . On the other hand, by the motor MG 2, since direction of rotation and the direction where torque acts become reverse, a motor MG 2 will operate as a generator and will revive electrical energy P_{m2} expressed by the product of torque T_{m2} and a rotational frequency N_r from the starter-ring shaft 126. In this case, if electrical energy P_{m1} consumed by the motor MG 1 and electrical energy P_{m2} revived by the motor MG 2 are made equal, electrical energy P_{m1} consumed by the motor MG 1 can be exactly provided by the motor MG 2.

[0048] In the state of the collinear view of such drawing 6 and drawing 7, since the rotational frequency N_r of the link gear shaft 126 is larger than the rotational frequency N_e N_c of an engine 150, i.e., the rotational frequency of the carrier shaft 127, the one-way clutch 38 attached in the starter-ring shaft 126 will be in an engagement state, by rotation of the starter-ring shaft 126, the drive gear 30 drives both the oil pressure generators 20, and they generate oil pressure.

[0049] Although the case where an engine 150 was operated on the operation point of the rotational frequency N_e smaller than the rotational frequency N_r of the starter-ring shaft 126 was explained in the state of the collinear view of drawing 6 and drawing 7, the power output unit 110 of an example can also operate an engine 150 on the operation point of the bigger rotational frequency N_e than the rotational frequency N_r of the starter-ring shaft 126, as shown in drawing 8. In this case, since the rotational frequency N_c of the carrier shaft 127 combined with the crankshaft 156 of an engine 150 through the planetary carrier 124 becomes larger than the rotational frequency N_r of the starter-ring shaft 126, in the oil pressure generator 20, the one-way clutch 36 attached in the carrier shaft 127 will be in an engagement state, and oil pressure will be generated by rotation of the carrier shaft 127.

[0050] Moreover, the power output unit 110 of an example can stop operation of an engine 150, and can also drive it by the motor MG 2. The collinear view at this time is illustrated to drawing 9. Since the engine 150 has stopped operation, the rotational frequency N_e of an engine 150 serves as a value 0, and the rotational frequency N_c of the carrier shaft 127 also serves as a value 0, so that it may illustrate. However, since the starter-ring shaft 126 is carrying out the rotation drive by the motor MG 2, the oil pressure generator 20 can generate oil pressure by rotation of this starter-ring shaft 126.

[0051] The power output unit 110 of an example can operate an engine 150, where vehicles are suspended, and it can also charge the battery with which a control unit 180 is equipped and which is not illustrated by operating a motor MG 1 as a generator. The collinear view of this state is shown in drawing 10. Since vehicles are in the stopped state so that it may illustrate, the rotational frequency N_r of the starter-ring shaft 126 serves as a value 0. However, since the engine 150 is operated, the oil pressure generator 20 can generate oil pressure with the carrier shaft 127 combined with the crankshaft 156 of this engine 150.

[0052] As mentioned above, by having the oil pressure generator 20 connected to the starter-ring shaft 126 and the carrier shaft 127 according to the explained power output unit 110 of an example, if either of the starter-ring shaft 126 and the carrier shaft 127 is rotating, oil pressure can be generated. That is, if the engine 150 is operated or vehicles are moving forward, oil pressure can be generated with the oil pressure generator 20. And since one-way clutches 36 and 38 are used for the starter-ring shaft 126 and the carrier shaft 127 and it connects with the composition of one gear pump, equipment can be miniaturized as compared with the composition which equips separately the starter-ring shaft 126 and the carrier shaft 127 with a gear pump.

[0053] Moreover, in the power output unit 110 of an example, since it forms as the case 147 where the casing 22 of the oil pressure generator 20 was attached in the stator 143 of a motor

MG 2, and one, the oil pressure generator 20 can be made into the big mass which vibrates united with a motor MG 2, and the damping effect over vibration can be enlarged. and the engagement by which prepared some path clearance for engagement to the carrier shaft 127 as an input shaft of an engine 150 and one-way clutch 36 which are the generation source of vibration in the carrier shaft 127, and attachment fixation was carried out -- the shell considered as the composition performed through a member 44 -- Even if backlash arises on the carrier shaft 127 by vibration, disturbance, etc. which an engine 150 does not expect, this backlash can be absorbed and the input to the oil pressure generators 20, such as disturbance, can be made small.

[0054] Although the starter-ring shaft 126 and an one-way clutch 38 shall be engaged directly, you may make it the engagement member of the carrier shaft 127 and an one-way clutch 36 by which prepares some path clearance in the starter-ring shaft 126 like engagement, and attachment fixation is carried out, and an one-way clutch 38 engaged in the power output unit 110 of an example. If it carries out like this, the backlash produced on the starter-ring shaft 126 can be absorbed, and the oil pressure generator 20, as a result the power output unit 110 can be made into what [more durable / a thing and what has a more high precision].

[0055] In the power output unit 110 of an example, it is good also as composition which attaches the oil pressure generator 20 in what power output unit in which the drive with an engine and the drive by the motor are possible although the oil pressure generator 20 was attached in the composition driven by the engine 150, the planetary gear 120, and a motor MG 1 and Motor MG 2.

[0056] As mentioned above, although the gestalt of operation of this invention was explained, as for this invention, it is needless to say that it can carry out with the gestalt which is not limited to the gestalt of such operation at all, and becomes various within limits which do not deviate from the power output unit of an example from the summary of means of transportation, such as a vessel and an aircraft, and this inventions, such as composition carried in various industrial machines etc. in addition to this.

[Translation done.]

* NOTICES *

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.*** shows the word which can not be translated.

3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the cross section which illustrates the outline composition of the oil pressure generator 20 which is one example of this invention.

[Drawing 2] It is the cross section of the B-B line cross section of the oil pressure generator 20 of drawing 1 .

[Drawing 3] It is the ** type view which illustrates typically the composition of the oil pressure generator 50 which is a modification.

[Drawing 4] It is the ** type view which illustrates typically the composition of the oil pressure generator 60 which is a modification.

[Drawing 5] It is the block diagram which illustrates the outline composition of the power output unit 110 equipped with the oil pressure generator 20 of an example as composition.

[Drawing 6] It is the collinear view showing the rotational frequency of three shafts and the relation of torque which were combined with the planetary gear 120.

[Drawing 7] It is the collinear view showing the rotational frequency of three shafts and the relation of torque which were combined with the planetary gear 120.

[Drawing 8] It is a collinear view when the rotational frequency Ne of an engine 150 is bigger than the rotational frequency Nr of the starter-ring shaft 126.

[Drawing 9] It is a collinear view in case operation of an engine 150 is stopped.

[Drawing 10] It is a collinear view in the case of having stopped rotation of the starter-ring shaft 126.

[Drawing 11] It is the block diagram which illustrates the outline composition of the gear pump 200 of the conventional example.

[Description of Notations]

20 -- Oil pressure generator

22 -- Casing

24 -- Inflow path

26 -- Outflow path

28 -- Tap hole

30 -- Drive gear

32 -- Driven gear

34 -- Crescent sash lock

36 38 -- One-way clutch

40 -- Holddown member

42 -- Axis of rotation

44 -- engagement -- a member

44a -- Lock-pin

46 -- Axis of rotation

50 -- Oil pressure generator

52 54 -- One-way clutch

56 58 -- Axis of rotation

60 -- Oil pressure generator

62-66 -- One-way clutch
72-76 -- Axis of rotation
110 -- Power output unit
111 -- Power transfer gear
112 -- Driving shaft
114 -- Differential gear
116,118 -- Driving wheel
120 -- Planetary gear
121 -- Sun gear
122 -- Starter ring
123 -- Planetary pinion gear
124 -- Planetary carrier
125 -- Sun gear shaft
126 -- Link gear shaft
126 -- Starter-ring shaft
127 -- Carrier shaft
128 -- Power extraction gear
129 -- Chain belt
132,142 -- Rota
133,143 -- Stator
134,144 -- Three phase coil
135,145 -- Permanent magnet
139,149 -- Resolver
142 -- Rota
147 -- Case
150 -- Engine
156 -- Crankshaft
180 -- Control unit
200 -- Gear pump
202 -- Drive gear
204 -- Driven gear
220 -- Casing
224 -- Inflow path
226 -- Outflow path
230 -- Drive gear
232 -- Driven gear
234 -- Crescent sash lock
MG1 -- Motor
MG2 -- Motor

[Translation done.]

* NOTICES *

Japan Patent Office is not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

CORRECTION or AMENDMENT

[Official Gazette Type] Printing of amendment by the convention of 2 of Article 17 of patent law
 [Section partition] The 2nd partition of the 5th section
 [Date of issue] October 26, Heisei 11 (1999)

[Publication No.] Publication number 10-89446
 [Date of Publication] April 7, Heisei 10 (1998)
 [**** format] Open patent official report 10-895
 [Filing Number] Japanese Patent Application No. 9-87728
 [International Patent Classification (6th Edition)]

F16H 57/02 501

[FI]

F16H 57/02 501 D

[Procedure revision]
 [Filing Date] January 13, Heisei 11
 [Procedure amendment 1]
 [Document to be Amended] Specification
 [Item(s) to be Amended] Claim
 [Method of Amendment] Change
 [Proposed Amendment]
 [Claim(s)]

[Claim 1] It is the oil pressure generator which generates oil pressure according to the rotational-motion force in which it is inputted into an input shaft.

The two or more axes of rotation which can input different rotational-motion force, It intervenes, respectively between the two or more [above] axes of rotation and the aforementioned input shaft for the rotational-motion force input to the aforementioned input shaft, and although the rotational-motion force of the predetermined direction is transmitted, it has the one-way clutch which does not transmit the rotational-motion force of a direction opposite to this predetermined direction.

The aforementioned input shaft is an oil pressure generator characterized by having opening in a shaft center, and arranging and having an one-way clutch for every two or more [above] axes of rotation in this opening.

[Claim 2] Each of the aforementioned input shaft and the two or more [above] axes of rotation is an oil pressure generator according to claim 1 arranged in the shape of the said heart.

[Claim 3] It is the power output unit which outputs power to a driving shaft.

The prime mover which has an output shaft,

The 1st motor which has the 1st axis of rotation, and outputs and inputs power to this 1st axis of rotation,

The 2nd motor which has the 2nd axis of rotation combined with the aforementioned driving

shaft, and outputs and inputs power to this 2nd axis of rotation,

A 3 shaft type power I/O means by which the power outputted and inputted to one residual shaft based on the this determined power when the power which has three shafts respectively combined with the output shaft of the aforementioned prime mover, the 1st axis of rotation of the 1st motor of the above, and the 2nd axis of rotation of the 2nd motor of the above, and is outputted and inputted among these three shafts to any 2 shafts is determined is determined, It has an oil pressure generator according to claim 1 or 2.

It is the power output unit whose two axes of rotation are the axis of rotation combined with the output shaft of the aforementioned prime mover, and the axis of rotation combined with the 2nd axis of rotation of the 2nd motor of the above between the two or more axes of rotation of the aforementioned oil pressure generator.

[Claim 4] The aforementioned oil pressure generator is a power output unit according to claim 3 which it comes to support as the 2nd motor of the above, and one.

[Claim 5] The power output unit according to claim 3 or 4 which comes to prepare the gap which can absorb backlash between the axes of rotation and these output shafts which are combined with the aforementioned output shaft of the aforementioned oil pressure generator.

[Claim 6] There is no claim 3 which comes to prepare the gap which can absorb backlash between the axis of rotation and this 2nd axis of rotation which are combined with the 2nd axis of rotation of the above of the aforementioned oil pressure generator, and it is the power output unit of a publication 5 either.

[Procedure amendment 2]

[Document to be Amended] Specification

[Item(s) to be Amended] 0009

[Method of Amendment] Change

[Proposed Amendment]

[0009]

[A The means for solving a technical problem, and its operation and effect] The two or more axes of rotation which can input rotational-motion force which the oil pressure generator of this invention is an oil pressure generator which generates oil pressure according to the rotational-motion force in which it is inputted into an input shaft, and is different, It intervenes, respectively between the two or more [above] axes of rotation and the aforementioned input shaft for the rotational-motion force input to the aforementioned input shaft. Although the rotational-motion force of the predetermined direction is transmitted, it has the one-way clutch which does not transmit the rotational-motion force of a direction opposite to this predetermined direction, and the aforementioned input shaft has opening in a shaft center, and it is characterized by arranging and having an one-way clutch for every two or more [above] axes of rotation in this opening.

[Procedure amendment 3]

[Document to be Amended] Specification

[Item(s) to be Amended] 0010

[Method of Amendment] Change

[Proposed Amendment]

[0010] The oil pressure generator of this this invention makes rotational-motion 1 of the two or more axes of rotation transmit to an input shaft by the one-way clutch made to intervene, respectively between different two or more axes of rotation and input shafts which can input the rotational-motion force, and generates oil pressure according to the rotational-motion force in which it is inputted into an input shaft in this way.

[Procedure amendment 4]

[Document to be Amended] Specification

[Item(s) to be Amended] 0011

[Method of Amendment] Change

[Proposed Amendment]

[0011] According to the oil pressure generator of such this invention, since one of the two or more axes of rotation is chosen through an one-way clutch, oil pressure can be generated with the power outputted from one source of power chosen among the power outputted from two or

more sources of power.

[Procedure amendment 5]

[Document to be Amended] Specification

[Item(s) to be Amended] 0012

[Method of Amendment] Change

[Proposed Amendment]

[0012] And in the oil pressure generator of this this invention, since transfer of the rotational-motion force to an input shaft is made by the one-way clutch for every axis of rotation, the axis of rotation with the largest rotational frequency of the predetermined direction is chosen between the two or more axes of rotation. Therefore, while being able to generate oil pressure with the power inputted into the biggest axis of rotation of the rotational frequency of the predetermined direction, simple composition can constitute the oil pressure generator which chooses the biggest axis of rotation of the rotational frequency of the predetermined direction. In addition, in the oil pressure generator of this invention, since the one-way clutch for every axis of rotation was arranged in opening of an input-shaft shaft center, this one-way clutch is settled in opening. Therefore, -izing of the equipment size can be carried out [short **] about the shaft orientations of an input shaft, and the miniaturization of the part and equipment can be attained.

[Procedure amendment 6]

[Document to be Amended] Specification

[Item(s) to be Amended] 0013

[Method of Amendment] Change

[Proposed Amendment]

[0013] In the oil pressure generator of this this invention, each of the aforementioned input shaft and the two or more [above] axes of rotation can also be arranged in the shape of the said heart. If it carries out like this, -izing can be carried out [short **] also about the direction size of a path of an input shaft, and equipment can be miniaturized more.

[Procedure amendment 7]

[Document to be Amended] Specification

[Item(s) to be Amended] 0015

[Method of Amendment] Change

[Proposed Amendment]

[0015] The power output unit of this this invention outputs and inputs the power with which a 3 shaft type power I/O means to have three shafts respectively combined with the output shaft of a prime mover, the 1st axis of rotation of the 1st motor, and the 2nd axis of rotation of the 2nd motor is determined based on this power outputted and inputted when power is outputted and inputted to any 2 shafts of these three shafts from one residual shaft. An oil pressure generator sets the two or more axes of rotation for the rotational-motion force transfer to the input shaft through the one-way clutch as the axis of rotation combined with the output shaft of a prime mover, and the axis of rotation combined with the 2nd axis of rotation of the 2nd motor, and generates oil pressure with the power outputted from a prime mover, or the power outputted from the 2nd motor.

[Procedure amendment 8]

[Document to be Amended] Specification

[Item(s) to be Amended] 0016

[Method of Amendment] Change

[Proposed Amendment]

[0016] According to the power output unit of such this invention, oil pressure can be generated with the power outputted from a prime mover, or the power outputted from the 2nd motor by choosing the axis of rotation combined with the output shaft of a prime mover, and the axis of rotation combined with the 2nd axis of rotation of the 2nd motor through an one-way clutch.

[Procedure amendment 9]

[Document to be Amended] Specification

[Item(s) to be Amended] 0017

[Method of Amendment] Change

[Proposed Amendment]

[0017] In the power output unit of such this invention, it shall come to support the aforementioned oil pressure generator as the 2nd motor of the above, and one. If it carries out like this, to the oil pressure generator with which the arrangement relation between an one-way clutch and an input shaft was specified, and the miniaturization was attained, the 2nd motor will become what of the damping effect has large mass big, and an oil pressure generator will become the 2nd motor and the thing of one on it. Therefore, disturbance, such as vibration of the prime mover inputted into an oil pressure generator, can be made small. Consequently, while being able to raise the endurance of an oil pressure generator, as a result the endurance of a power output unit, precision of an oil pressure generator, as a result a power output unit can be made high.

[Procedure amendment 10]

[Document to be Amended] Specification

[Item(s) to be Amended] 0020

[Method of Amendment] Change

[Proposed Amendment]

[0020] The oil pressure generator 20 is equipped with the crescent sash lock 34 pinched with the casing 22 which is the same composition as the gear pump 200 of the conventional example explained using drawing 11, i.e., the composition as a gear pump, the drive gear 30, the driven gear 32 which gears with the drive gear 30 and rotates, and the drive gear 30 and a driven gear 32 as shown in drawing 1 and drawing 2. And this oil pressure generator 20 is equipped with the one-way clutch 38 which engages with the 2nd axis of rotation 46 of the hollow shaft to which the shaft center was penetrated free [rotation] to the 1st axis of rotation 42 only at the time of rotation of the predetermined direction as characteristic composition as well as the one-way clutch 36 to which it engages with the 1st axis of rotation 42 of a hollow shaft only at the time of rotation of the predetermined direction. As shown in drawing 1 and drawing 2, these one-way clutches 36 and 38 are arranged in the breakthrough vacated for the shaft center of the drive gear 30, and are being fixed to the drive gear 30 through the holddown member 40. And let the drive gear 30, and the 1st and the 2nd axis of rotation 42 and 46 be these hearts by taking such arrangement.

[Procedure amendment 11]

[Document to be Amended] Specification

[Item(s) to be Amended] 0023

[Method of Amendment] Change

[Proposed Amendment]

[0023] According to the oil pressure generator 20 of an example explained above, oil pressure can be generated between the two axes of rotation 42 and 46 by rotation of the axis of rotation with the larger rotational frequency of the predetermined direction. Consequently, oil pressure can be generated, even while one side will not rotate, if either of the two axes of rotation 42 and 46 is rotating in the predetermined direction. And the two axes of rotation can be simply chosen only by doubling the engaged direction and attaching an one-way clutch. Moreover, in this oil pressure generator 20, as shown in drawing 1 and drawing 2, the concentric arrangement of arrangement and receipt of the one-way clutches 36 and 38 into the breakthrough of the drive gear 30 and the drive gear 30, and the 1st and the 2nd axis of rotation 42 and 46 were taken. Therefore, since-izing of both the equipment sizes can be carried out [short **] about the shaft orientations and the direction of a path of the drive gear 30, the oil pressure generator itself can be miniaturized.

[Procedure amendment 12]

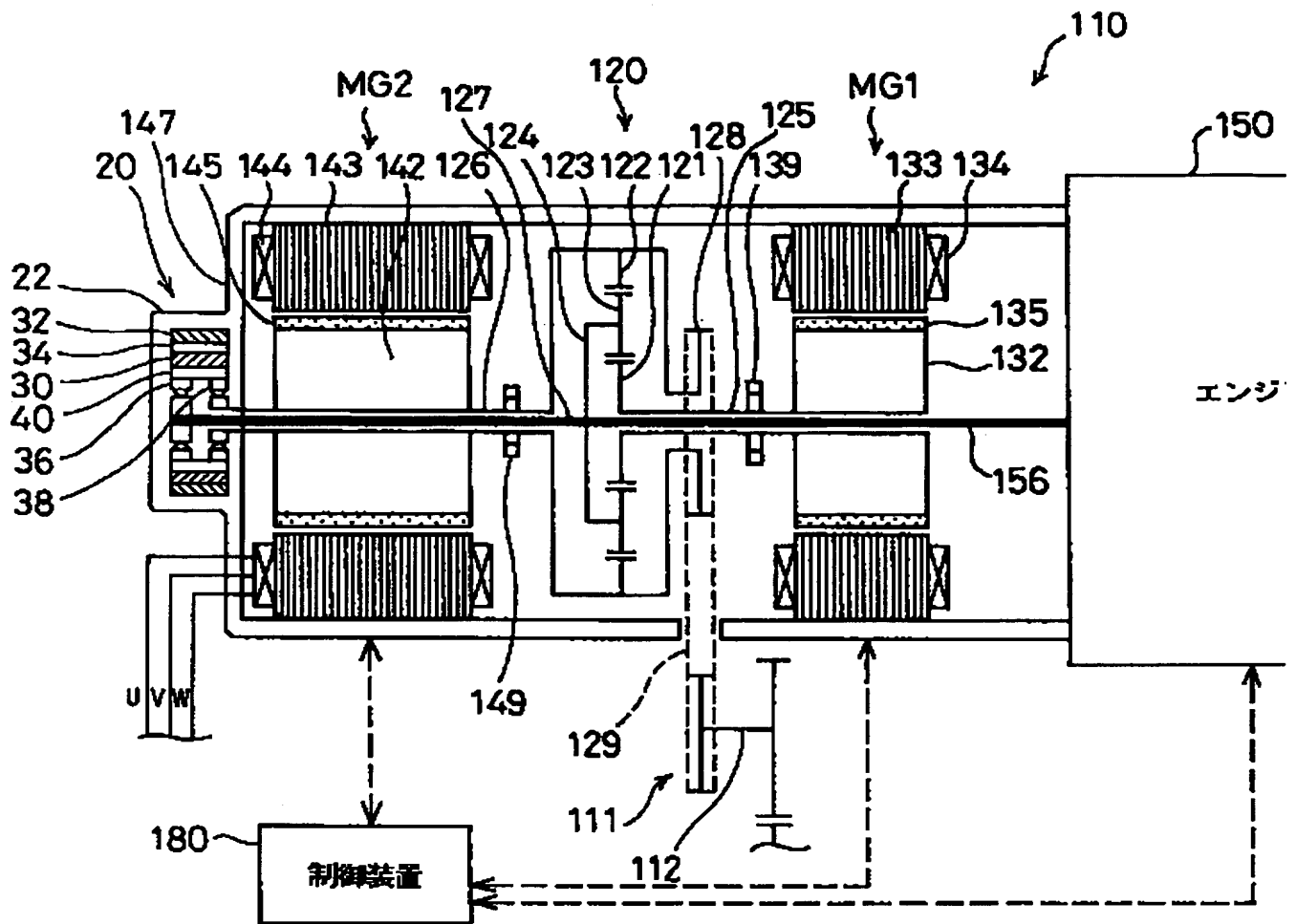
[Document to be Amended] DRAWINGS

[Item(s) to be Amended] drawing 5

[Method of Amendment] Change

[Proposed Amendment]

[Drawing 5]



[Translation done.]

(19)日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11)特許出願公開番号

特開平10-89446

(43)公開日 平成10年(1998) 4月7日

(51)Int.Cl.⁶

F 1 6 H 57/02

識別記号

5 0 1

F I

F 1 6 H 57/02

5 0 1 D

審査請求 未請求 請求項の数7 F D (全 11 頁)

(21)出願番号 特願平9-87728

(22)出願日 平成9年(1997) 3月21日

(31)優先権主張番号 特願平8-215284

(32)優先日 平8(1996) 7月26日

(33)優先権主張国 日本 (J P)

(71)出願人 000003207

トヨタ自動車株式会社

愛知県豊田市トヨタ町1番地

(72)発明者 足立 昌俊

愛知県豊田市トヨタ町1番地 トヨタ自動車株式会社内

(72)発明者 茨木 隆次

愛知県豊田市トヨタ町1番地 トヨタ自動車株式会社内

(72)発明者 畑 祐志

愛知県豊田市トヨタ町1番地 トヨタ自動車株式会社内

(74)代理人 弁理士 五十嵐 孝雄 (外2名)

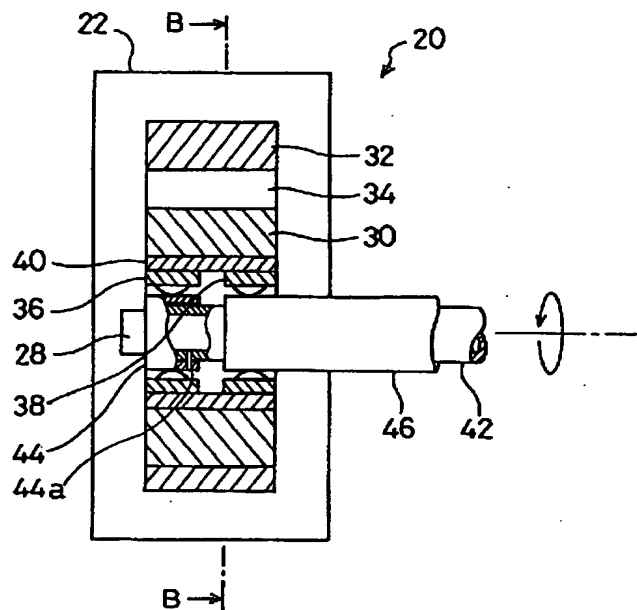
最終頁に続く

(54)【発明の名称】 油圧発生装置および動力出力装置

(57)【要約】

【課題】 2以上の回転動力のうち一つを入力動力として選択して油圧を発生する。

【解決手段】 油圧発生装置20は、歯車ポンプを構成するドライブギヤ30、ドリブンギヤ32およびクレセント34と、2つの回転軸42、46がドライブギヤ30に対してそれぞれが相対的に同一の方向に回転するときに係合するよう取り付けられたワンウェイクラッチ36、38とを備える。このため、2つの回転軸42、46が共に係合する方向に回転しているときには、回転数の大きい方の回転軸に取り付けられたワンウェイクラッチが係合し、ドライブギヤ30を駆動する。この結果、油圧発生装置20は、2つの回転軸42、46のうち回転数の大きい方の回転軸によって油圧を発生することができる。



【特許請求の範囲】

【請求項1】 入力軸に入力される回転動力により油圧を発生する油圧発生装置であって、異なる回転動力を入力可能な2以上の回転軸と、該2以上の回転軸のうち一つを前記入力軸として選択する選択手段とを備える油圧発生装置。

【請求項2】 前記選択手段は、前記2以上の回転軸のうち所定方向の回転数が最も大きい回転軸を選択する手段である請求項1記載の油圧発生装置。

【請求項3】 前記選択手段は、前記所定方向の回転のときには回転動力を伝達するが該所定方向と反対の方向の回転のときには回転動力を伝達しないワンウェイクラッチを、前記2以上の回転軸の各々に前記入力軸に対して取り付けてなる手段である請求項2記載の油圧発生装置。

【請求項4】 駆動軸に動力を出力する動力出力装置であって、出力軸を有する原動機と、第1の回転軸を有し、該第1の回転軸に動力を入出力する第1の電動機と、前記駆動軸に結合される第2の回転軸を有し、該第2の回転軸に動力を入出力する第2の電動機と、前記原動機の出力軸と前記第1の電動機の第1の回転軸と前記第2の電動機の第2の回転軸とに各々結合される3軸を有し、該3軸のうちいずれか2軸へ入出力される動力を決定したとき、該決定された動力に基づいて残余の1軸へ入出力される動力が決定される3軸式動力入出力手段と、請求項1ないし3いずれか記載の油圧発生装置とを備え、前記油圧発生装置の2以上の回転軸のうち2つの回転軸は、前記原動機の出力軸に結合される回転軸と前記第2の電動機の第2の回転軸に結合される回転軸である動力出力装置。

【請求項5】 前記油圧発生装置は、前記第2の電動機と一体として支持されてなる請求項4記載の動力出力装置。

【請求項6】 前記油圧発生装置の前記出力軸に結合される回転軸と該出力軸との間にガタを吸収可能な間隙を設けてなる請求項4または5記載の動力出力装置。

【請求項7】 前記油圧発生装置の前記第2の回転軸に結合される回転軸と該第2の回転軸との間にガタを吸収可能な間隙を設けてなる請求項4ないし6いずれか記載の動力出力装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、油圧発生装置および動力出力装置に関し、詳しくは、入力軸に入力される回転動力により油圧を発生する油圧発生装置およびこれを備え駆動軸に動力を出力する動力出力装置に関する。

【0002】

【従来の技術】従来、この種の油圧発生装置としては、車両に搭載される油圧発生装置であって、トルクコンバータへの送油やトランスミッション内のプラネタリギヤユニットの潤滑およびトランスミッションの油圧制御の作用油圧供給等のために、トランスミッションの一構成部品として原動機（例えば、ガソリンエンジンやディーゼルエンジンなどの内燃機関等）のクランクシャフトに直接または間接に取り付けられ、原動機からクランクシャフトに出力される回転動力の一部を動力として駆動するものが提案されている。この装置は、例えば、図11に例示する歯車ポンプ200のように、ケーシング220と、クランクシャフトに結合されたドライブギヤ230と、ドライブギヤ230と噛み合って回転するドリブンギヤ232と、ドライブギヤ230とドリブンギヤ232とで挟持されるクレセント234とから構成され、ドライブシャフトの回転に伴ってドライブギヤ230とドリブンギヤ232が回転することにより油圧を発生させる。なお、ケーシング220には、オイルの流入通路224および流出通路226が形成されている。

【0003】

【発明が解決しようとする課題】近年、環境保全やエネルギー資源の効率利用の観点から、原動機と発電機と電動機とバッテリーとを搭載し、原動機から出力される動力による走行と、電動機から出力される動力による走行と、原動機と電動機とからそれぞれ出力される動力による走行とを可能とする、いわゆるハイブリッド型の電気自動車提案されている。こうしたハイブリッド型の電気自動車でも、原動機のクランクシャフトと駆動輪に結合される駆動軸との接続がギヤ装置による場合にはこのギヤ装置の潤滑のために、原動機のクランクシャフトと駆動軸との接続がクラッチによる場合にはこのクラッチの動作のために、また、変速機等のギヤ装置を備えるときにはこのギヤ装置の潤滑のために、油圧発生装置が必要となる。

【0004】しかしながら、こうしたハイブリッド型の電気自動車に搭載する油圧発生装置として前述の歯車ポンプ200を原動機のクランクシャフトに取り付けた場合、原動機が運転されているときには油圧を発生できるが、電動機から出力される動力により走行し原動機の運転を停止しているときには油圧発生装置は動作しないから油圧を発生させることができず、クラッチの動作やギヤ装置の潤滑等が行えないという問題があった。一方、歯車ポンプ200を駆動軸に取り付け、駆動軸の回転動力により油圧を発生させる手法もあるが、車両が停止しているときには、油圧を発生できないという問題を生じる。

【0005】こうした問題に対して、原動機のクランクシャフトと駆動軸とにそれぞれ歯車ポンプ200を取り付けることも考えられるが、歯車ポンプ200が2つ必

要となることから部品数が多くなり装置が大型化するという問題や、油圧回路が複雑になるという問題が生じる。

【0006】これらの問題は、原動機と電動機とを搭載する車両に限定されるものではなく、2以上の動力源から出力される動力により動作するすべての駆動装置についてもいえることである。

【0007】なお、出願人は、以前に、ギヤ装置を備えるハイブリッド型の電気自動車であって、原動機のクランクシャフトに油圧ポンプを取り付けた構成（特開昭50-30223号公報）や、原動機のクランクシャフトと駆動軸のそれぞれに油圧ポンプを取り付けた構成（特開昭48-49115号公報）を提案している。

【0008】本発明の油圧発生装置および動力出力装置は、こうした問題を解決し、2以上の回転動力のうち一つを入力動力として選択して油圧を発生することを目的とする。また、本発明の動力出力装置は、油圧発生装置への原動機の振動等の外乱の入力を小さくして、装置の耐久性を向上させると共に精度の高い装置とすることを目的の一つとする。

【0009】

【課題を解決するための手段およびその作用・効果】本発明の油圧発生装置は、入力軸に入力される回転動力により油圧を発生する油圧発生装置であって、異なる回転動力を入力可能な2以上の回転軸と、該2以上の回転軸のうち一つを前記入力軸として選択する選択手段とを備えることを要旨とする。

【0010】この本発明の油圧発生装置は、異なる回転動力を入力可能な2以上の回転軸のうち、選択手段により一つを入力軸として選択することにより、入力軸に入力される回転動力により油圧を発生する。

【0011】こうした本発明の油圧発生装置によれば、2以上の回転軸のうち一つを選択して動力の入力軸とするから、2以上の動力源から出力される動力のうち選択された一つの動力源から出力される動力により油圧を発生することができる。

【0012】この本発明の油圧発生装置において、前記選択手段は、前記2以上の回転軸のうち所定方向の回転数が最も大きい回転軸を選択する手段であるものとする。こうすれば、所定方向の回転数の最も大きな回転軸に入力される動力により油圧を発生することができる。

【0013】こうした所定方向の回転数の最も大きな回転軸を選択する油圧発生装置において、前記選択手段は、前記所定方向の回転のときには回転動力を伝達するが該所定方向と反対の方向の回転のときには回転動力を伝達しないワンウェイクラッチを、前記2以上の回転軸の各々に前記入力軸に対して取り付けてなる手段であるものとする。こうすれば、所定方向の回転数の最も大きな回転軸を選択する油圧発生装置を簡易な

構成により構成することができる。

【0014】本発明の動力出力装置は、駆動軸に動力を出力する動力出力装置であって、出力軸を有する原動機と、第1の回転軸を有し、該第1の回転軸に動力を入出力する第1の電動機と、前記駆動軸に結合される第2の回転軸を有し、該第2の回転軸に動力を入出力する第2の電動機と、前記原動機の出力軸と前記第1の電動機の第1の回転軸と前記第2の電動機の第2の回転軸とに各々結合される3軸を有し、該3軸のうちいずれか2軸へ入出力される動力を決定したとき、該決定された動力に基づいて残余の1軸へ入出力される動力が決定される3軸式動力入出力手段と、前述の変形例を含めた本発明の油圧発生装置とを備え、前記油圧発生装置の2以上の回転軸のうち2つの回転軸は、前記原動機の出力軸に結合される回転軸と前記第2の電動機の第2の回転軸に結合される回転軸であることを要旨とする。

【0015】この本発明の動力出力装置は、3軸式動力入出力手段が、原動機の出力軸と第1の電動機の第1の回転軸と第2の電動機の第2の回転軸とに各々結合される3軸を有する3軸式動力入出力手段が、これらの3軸のうちのいずれか2軸へ動力が入出力されたとき、この入出力された動力に基づいて決定される動力を残余の1軸から入出力する。油圧発生装置は、原動機の出力軸に結合される回転軸と第2の電動機の第2の回転軸に結合される回転軸とを入力軸として選択可能な2以上の回転軸とし、原動機から出力される動力や第2の電動機から出力される動力により油圧を発生する。

【0016】こうした本発明の動力出力装置によれば、原動機の出力軸に結合される回転軸や第2の電動機の第2の回転軸に結合される回転軸を選択することにより、原動機から出力される動力や第2の電動機から出力される動力により油圧を発生することができる。

【0017】こうした本発明の動力出力装置において、前記油圧発生装置は、前記第2の電動機と一体として支持されてなるものとする。こうすれば、油圧発生装置に対して質量が大きく制振効果の大きな第2の電動機と一体のものとなるから、油圧発生装置へ入力される原動機の振動等の外乱を小さくすることができる。この結果、油圧発生装置の耐久性、延いては動力出力装置の耐久性を向上させることができると共に、油圧発生装置、延いては動力出力装置の精度を高くすることができる。

【0018】こうした油圧発生装置が第2の電動機と一体として支持されてなる動力出力装置において、前記油圧発生装置の前記出力軸に結合される回転軸と該出力軸との間にガタを吸収可能な間隙を設けてなるものとしたり、前記油圧発生装置の前記第2の回転軸に結合される回転軸と該第2の回転軸との間にガタを吸収可能な間隙を設けてなるものとする。こうすれば、原動機の出力軸や第2の回転軸に予期しない振動等の外乱

が生じて、外乱の油圧発生装置への入力を小さくすることができる。

【0019】

【発明の実施の形態】次に、本発明の実施の形態を実施例に基づき説明する。図1は本発明の一実施例としての油圧発生装置20の概略構成を示す断面図、図2は図1の油圧発生装置20のB-B断面を示す断面図である。なお、図1は、図2におけるA-A断面を示す断面図となる。

【0020】油圧発生装置20は、図1および図2に示すように、図11を用いて説明した従来例の歯車ポンプ200と同一の構成、即ち、歯車ポンプとしての構成であるケーシング22と、ドライブギヤ30と、ドライブギヤ30と噛み合って回転するドリブンギヤ32と、ドライブギヤ30とドリブンギヤ32とで挟持されるクレセント34とを備える他、所定方向の回転のときのみ中空軸の第1の回転軸42と係合するワンウェイクラッチ36と、同じく所定方向の回転のときのみ軸中心を第1の回転軸42に回転自在に貫通された中空軸の第2の回転軸46と係合するワンウェイクラッチ38と、ワンウェイクラッチ36、38をドライブギヤ30に固定する固定部材40とを備える。

【0021】ケーシング22には、図2に示すように、ドライブギヤ30とドリブンギヤ32の隙間のうちクレセント34の右下側の隙間と連通するオイルの流入通路24と、同じくクレセント34の左下側の隙間と連通するオイルの流出通路26とが形成されている。この流出通路26は、図1に示すケーシング22に形成された流出口28と連絡しており、オイルは、この流出口28から第1の回転軸42の内側へ圧送される。

【0022】ワンウェイクラッチ36は、第1の回転軸42がドライブギヤ30に対して相対的に図1中の矢印の方向に回転しようとするときに第1の回転軸42の外周に取付固定された円環状の係合部材44に係合するよう取り付けられている。実施例では、この係合部材44は、第1の回転軸42との間に若干のクリアランスが設けられた状態で固定ピン44aにより第1の回転軸42に固定されている。したがって、第1の回転軸42が外力により偏心してもこのクリアランスによっていわゆるガタが吸収されるようになっている。また、ワンウェイクラッチ38は、第2の回転軸46がドライブギヤ30に対して相対的に図1中の矢印の方向に回転しようとするときに第2の回転軸46に係合するよう取り付けられている。このように第1の回転軸42および第2の回転軸46に取り付けることにより、第1の回転軸42と第2の回転軸46とが共に図1中の矢印の方向に回転しているときには、その回転数の大きい方の回転軸に取り付けられたワンウェイクラッチが係合してドライブギヤ30を回転させることができる。このとき、回転数の小さい方の回転軸はドライブギヤ30に対する相対的な回転

としては図1中の矢印と反対方向の回転となるから、この回転軸に取り付けられたワンウェイクラッチの状態は係合を解除した状態となる。したがって、ドライブギヤ30は、2つの回転軸42、46のうち、常に図1中の矢印の方向の回転数の大きい方の回転軸により回転駆動することになり、油圧発生装置20は、この回転数の大きい方の回転軸により油圧を発生することになる。

【0023】以上説明した実施例の油圧発生装置20によれば、2つの回転軸42、46のうち所定方向の回転数の大きい方の回転軸の回転によって油圧を発生することができる。この結果、2つの回転軸42、46のいずれかが所定方向に回転していれば一方が回転していないときでも油圧を発生することができる。しかも、ワンウェイクラッチを、その係合する方向を合わせて取り付けただけで2つの回転軸の選択を簡易に行なうことができる。

【0024】また、実施例の油圧発生装置20によれば、第1の回転軸42と若干のクリアランスを設けて取付固定される係合部材44とワンウェイクラッチ36とが係合するようにしているから、第1の回転軸42が外力によって偏心等することによって生じるガタを吸収することができる。この結果、油圧発生装置20をより耐久性のあるものにすることができ、より精度の高いものにすることができる。

【0025】実施例の油圧発生装置20では、第1の回転軸42が第2の回転軸46の軸中心を回転自在に貫通した2つの回転軸に接続するものとしたが、図3の変形例の油圧発生装置50に示すように、対向する方向から延出した2つの回転軸56、58にそれぞれワンウェイクラッチ52、54を介して接続するものとしてもよい。なお、図3の変形例の油圧発生装置50では、2つの回転軸56、58と2つのワンウェイクラッチ52、54だけを模式的に記載し、他の構成の図示は省略したが、この他の構成については実施例の油圧発生装置20と同一である。

【0026】実施例の油圧発生装置20では、2つの回転軸42、46に2つのワンウェイクラッチ36、38をそれぞれ所定方向に係合するよう取り付けただが、3以上の回転軸に3以上のワンウェイクラッチをそれぞれ所定方向に係合するよう取り付けものとしてもよい。例えば、図4の変形例の油圧発生装置60に示すように、3つの回転軸72～76に3つのワンウェイクラッチ62～66をそれぞれ所定方向に係合するよう取り付けものとしてもよい。こうすれば、3以上の回転軸のうち所定方向の回転数が最も大きい回転軸により油圧を発生することができる。なお、図4の変形例の油圧発生装置60も図3と同様に3つの回転軸72～76と3つのワンウェイクラッチ62～66だけを模式的に記載した。

【0027】実施例の油圧発生装置20では、2つの回転軸42、46にワンウェイクラッチ36、38を用い

て歯車ポンプ（ドライブギヤ30、ドリブンギヤ32およびクレセント34とからなる歯車ポンプ）に接続する構成としたが、2つの回転軸42、46にワンウェイクラッチ36、38を用いてクレセント34を備えない歯車ポンプに接続する構成としてもよいことは勿論、回転軸を動力の入力軸として油圧を発生するものであれば、歯車ポンプの構成以外の如何なる構成としてもよい。

【0028】実施例の油圧発生装置20では、第2の回転軸46とワンウェイクラッチ38とが直接係合するものとしたが、第1の回転軸42とワンウェイクラッチ36との係合のように、第2の回転軸46に若干のクリアランスを設けて取付固定される係合部材とワンウェイクラッチ38とが係合するようにしてもよい。こうすれば、第2の回転軸46に生じるガタを吸収することができ、油圧発生装置20をより耐久性のあるもの及びより精度の高いものにすることができる。

【0029】実施例の油圧発生装置20では、第1の回転軸42と係合部材44とを固定ピン44aにより取り付けしたが、若干のクリアランスを設けた状態で固定できればいかなる手法により取り付けてもよい。

【0030】次に、本発明の一実施例としての油圧発生装置20を備える動力出力装置110について説明する。図5は、油圧発生装置20を備える動力出力装置110の概略構成を示すブロック図である。

【0031】図示するように、動力出力装置110は、大きくは、エンジン150、エンジン150のクランクシャフト156にプラネタリキャリア124が機械的に結合されたプラネタリギヤ120、プラネタリギヤ120のサンギヤ121に結合されたモータMG1、プラネタリギヤ120のリングギヤ122に結合されたモータMG2、モータMG1、MG2を駆動制御する制御装置180およびプラネタリギヤ120に潤滑油を供給する油圧発生装置20とから構成されている。

【0032】プラネタリギヤ120は、クランクシャフト156に軸中心を貫通された中空のサンギヤ軸125に結合されたサンギヤ121と、クランクシャフト156と同軸でキャリア軸127に軸中心を貫通された中空のリングギヤ軸126に結合されたリングギヤ122と、サンギヤ121とリングギヤ122との間に配置されサンギヤ121の外周を自転しながら公転する複数のプラネタリピニオンギヤ123と、クランクシャフト156の端部に結合され各プラネタリピニオンギヤ123の回転軸を軸支するプラネタリキャリア124とから構成されている。このプラネタリギヤ120では、サンギヤ121、リングギヤ122およびプラネタリキャリア124にそれぞれ結合されたサンギヤ軸125、リングギヤ軸126およびクランクシャフト156の3軸が動力の入出力軸とされ、3軸のうちいずれか2軸へ入出力される動力が決定されると、残余の1軸に入出力される動力は決定された2軸へ入出力される動力に基づいて定

まる。

【0033】リングギヤ122には、動力の取り出し用の動力取出ギヤ128がモータMG1側に結合されている。この動力取出ギヤ128は、チェーンベルト129により動力伝達ギヤ111に接続されており、動力取出ギヤ128と動力伝達ギヤ111との間で動力の伝達がなされる。したがって、動力出力装置110からの動力は、この動力伝達ギヤ111から取り出すことができる。

【0034】モータMG1とモータMG2は、共に同期電動発電機として構成されており、それぞれ外周面に複数の永久磁石135、145を有するロータ132、142と、回転磁界を形成する三相コイル134、144が巻回されたステータ133、143とを備える。モータMG1のロータ132は、プラネタリギヤ120のサンギヤ121に結合されたサンギヤ軸125に結合されており、モータMG2のロータ142は、プラネタリギヤ120のリングギヤ122に結合されたリングギヤ軸126に結合されている。また、各モータMG1、MG2にはそれぞれのロータ132、142の回転角度 θ_1 、 θ_2 を検出するためのレゾルバ139、149が設けられている。

【0035】油圧発生装置20は、プラネタリキャリア124に同軸に結合されたキャリア軸127とリングギヤ軸126とに2つワンウェイクラッチ36、38を介してそれぞれ接続されており、油圧発生装置20のケーシング22は、モータMG2のステータ143が取り付けられたケース147と一体として形成されている。なお、油圧発生装置20の構成は、2つの回転軸42、46をキャリア軸127およびリングギヤ軸126に代えた点およびケーシング22がケース147と一体として形成されている点を除いて図1および図2を用いて説明した油圧発生装置20と同一の構成をしている。したがって、ここでは油圧発生装置20の各構成の説明については省略する。このように動力出力装置110では、油圧発生装置20のケーシング22をケース147と一体として形成することによって油圧発生装置20をモータMG1と一体となって振動する大きなマスとするから、エンジン150を運転することによって生じる振動に対する制振効果を大きくすることができる。しかも、振動の発生源であるエンジン150の入力軸としてのキャリア軸127とワンウェイクラッチ36との係合をキャリア軸127に若干のクリアランスを設けて取付固定された係合部材44を介して行なう構成としたから、エンジン150の予期しない振動や外乱等によりキャリア軸127にガタが生じて、このガタを吸収することができ、外乱等の油圧発生装置20への入力を小さくすることができる。

【0036】制御装置180の詳細については図示しないが、制御装置180は、モータMG1およびモータM

G2の各三相コイル134, 144に供給する擬似的な正弦波電流を作り出す2つのインバータ回路と、2つのインバータ回路を介して充放電するバッテリーと、2つのインバータ回路のスイッチングを制御するモータ制御用CPUと、エンジン150の運転を制御するエンジン制御用CPUとを備え、モータMG1, モータMG2およびエンジン150の状態を検出する各種センサから入力される信号に基づいてモータMG1, モータMG2およびエンジン150の運転を制御する。この制御装置180による制御の詳細については、本発明の実施の形態としては不要であるから、その説明については省略する。

【0037】次に、こうして構成された動力出力装置110の動作について説明する。いま、エンジン150を回転数Ne, トルクTeの運転ポイントP1で運転し、このエンジン150から出力されるエネルギーPeと同一のエネルギーであるが異なる回転数Nr, トルクTrの運転ポイントP2でリングギヤ軸126を運転する場合、すなわち、エンジン150から出力される動力をトルク変換してリングギヤ軸126に作用させる場合について考える。

【0038】プラネタリギヤ120の3軸（サンギヤ軸125, リングギヤ軸126およびプラネタリキャリア124）における回転数やトルクの関係は、機構学の教えるところによれば、図6および図7に例示する共線図と呼ばれる図として表わすことができ、幾何学的に解くことができる。なお、プラネタリギヤ120における3軸の回転数やトルクの関係は、上述の共線図を用いなくても各軸のエネルギーを計算することなどにより数式的に解析することもできる。本実施例では説明の容易のため共線図を用いて説明する。

【0039】図6における縦軸は3軸の回転数軸であり、横軸は3軸の座標軸の位置の比を表わす。すなわち、サンギヤ軸125とリングギヤ軸126の座標軸S, Rを両端にとったとき、プラネタリキャリア124の座標軸Cは、軸Sと軸Rを1:ρに内分する軸として定められる。ここで、ρは、リングギヤ122の歯数に対するサンギヤ121の歯数の比であり、次式(1)で表わされる。

【0040】

【数1】

$$\rho = \frac{\text{サンギヤの歯数}}{\text{リングギヤの歯数}} \quad \cdots \cdots (1)$$

【0041】今、エンジン150が回転数Neで運転されており、リングギヤ軸126が回転数Nrで運転されている場合を考えているから、エンジン150のクランクシャフト156が結合されているプラネタリキャリア124の座標軸Cにエンジン150の回転数Neを、リングギヤ軸126の座標軸Rに回転数Nrをプロットすることができる。この両点を通る直線を描けば、この直

線と座標軸Sとの交点で表わされる回転数としてサンギヤ軸125の回転数Nsを求めることができる。以下、この直線を動作共線と呼ぶ。なお、回転数Nsは、回転数Neと回転数Nrとを用いて比例計算式（次式

(2)）により求めることができる。このようにプラネタリギヤ120では、サンギヤ121, リングギヤ122およびプラネタリキャリア124のうちいずれか2つの回転を決定すると、残余の1つの回転は、決定した2つの回転に基づいて決定される。

【0042】

【数2】

$$Ns = Nr - (Nr - Ne) \frac{1+\rho}{\rho} \quad \cdots \cdots (2)$$

【0043】次に、描かれた動作共線に、エンジン150のトルクTeをプラネタリキャリア124の座標軸Cを作用線として図中下から上に作用させる。このとき動作共線は、トルクに対してはベクトルとしての力を作用させたときの剛体として取り扱うことができるから、座標軸C上に作用させたトルクTeは、向きが同じで異なる作用線への力の分離の手法により、座標軸S上のトルクTesと座標軸R上のトルクTerとに分離することができる。このときトルクTesおよびTerの大きさは、次式(3)および(4)によって表わされる。

【0044】

【数3】

$$Tes = Te \times \frac{\rho}{1+\rho} \quad \cdots \cdots (3)$$

$$Ter = Te \times \frac{1}{1+\rho} \quad \cdots \cdots (4)$$

【0045】動作共線がこの状態で安定であるためには、動作共線の力の釣り合いをとればよい。すなわち、座標軸S上には、トルクTesと大きさが同じで向きが反対のトルクTm1を作用させ、座標軸R上には、リングギヤ軸126に出力するトルクTrと同じ大きさで向きが反対のトルクとトルクTerとの合力に対し大きさが同じで向きが反対のトルクTm2を作用させるのである。このトルクTm1はモータMG1により、トルクTm2はモータMG2により作用させることができる。このとき、モータMG1では回転の方向と逆向きにトルクを作用させるから、モータMG1は発電機として動作することになり、トルクTm1と回転数Nsとの積で表わされる電気エネルギーPm1をサンギヤ軸125から回生する。モータMG2では、回転の方向とトルクTm2の方向とが同じであるから、モータMG2は電動機として動作し、トルクTm2と回転数Nrとの積で表わされる電気エネルギーPm2を動力としてリングギヤ軸126に出力する。

【0046】ここで、電気エネルギーPm1と電気エネルギーPm2とを等しくすれば、モータMG2で消費する電力のすべてをモータMG1により回生して賄うことがで

きる。このためには、入力されたエネルギーのすべてを出力するものとすればよいから、エンジン150から出力されるエネルギー P_e とリングギヤ軸126に出力されるエネルギー P_r とを等しくすればよい。すなわち、トルク T_e と回転数 N_e との積で表わされるエネルギー P_e と、トルク T_r と回転数 N_r との積で表わされるエネルギー P_r とを等しくするのである。前述したように、リングギヤ軸126に出力された動力は、動力取出ギヤ128および動力伝達ギヤ111により駆動軸112に伝達され、ディファレンシャルギヤ114を介して駆動輪116、118に伝達される。したがって、リングギヤ軸126に出力される動力と駆動輪116、118に伝達される動力とはリニアな関係が成立するから、駆動輪116、118に伝達される動力は、リングギヤ軸126に出力される動力を制御することにより制御することができる。

【0047】図6に示す共線図ではサンギヤ軸125の回転数 N_s は正であったが、エンジン150の回転数 N_e とリングギヤ軸126の回転数 N_r とによっては、図7に示す共線図のように負となる場合もある。このときには、モータMG1では、回転の方向とトルクの作用する方向とが同じになるから、モータMG1は電動機として動作し、トルク T_{m1} と回転数 N_s との積で表わされる電気エネルギー P_{m1} を消費する。一方、モータMG2では、回転の方向とトルクの作用する方向とが逆になるから、モータMG2は発電機として動作し、トルク T_{m2} と回転数 N_r との積で表わされる電気エネルギー P_{m2} をリングギヤ軸126から回生することになる。この場合、モータMG1で消費する電気エネルギー P_{m1} とモータMG2で回生する電気エネルギー P_{m2} とを等しくすれば、モータMG1で消費する電気エネルギー P_{m1} をモータMG2で丁度賄うことができる。

【0048】こうした図6および図7の共線図の状態では、油圧発生装置20は、共にリングギヤ軸126の回転数 N_r の方がエンジン150の回転数 N_e 、即ちキャリア軸127の回転数 N_c より大きいから、リングギヤ軸126に取り付けられたワンウェイクラッチ38が係合状態となってリングギヤ軸126の回転によってドライブギヤ30が駆動し、油圧を発生する。

【0049】図6および図7の共線図の状態では、リングギヤ軸126の回転数 N_r より小さな回転数 N_e の運転ポイントでエンジン150を運転する場合について説明したが、実施例の動力出力装置110は、図8に示すように、リングギヤ軸126の回転数 N_r より大きな回転数 N_e の運転ポイントでエンジン150を運転することもできる。この場合、エンジン150のクランクシャフト156にプラネタリキャリア124を介して結合されたキャリア軸127の回転数 N_c がリングギヤ軸126の回転数 N_r より大きくなるから、油圧発生装置20では、キャリア軸127に取り付けられたワンウェイク

ラッチ36が係合状態となって、キャリア軸127の回転によって油圧を発生する。

【0050】また、実施例の動力出力装置110は、エンジン150の運転を停止し、モータMG2のみにより駆動することもできる。このときの共線図を図9に例示する。図示するように、エンジン150は運転を停止しているから、エンジン150の回転数 N_e は値0となり、キャリア軸127の回転数 N_c も値0となる。しかし、リングギヤ軸126はモータMG2により回転駆動しているから、油圧発生装置20は、このリングギヤ軸126の回転によって油圧を発生することができる。

【0051】実施例の動力出力装置110は、車両を停止した状態でエンジン150を運転し、モータMG1を発電機として機能させることにより制御装置180が備える図示しないバッテリーを充電することもできる。この状態の共線図を図10に示す。図示するように、車両は停止した状態であるから、リングギヤ軸126の回転数 N_r は値0となる。しかし、エンジン150が運転されているから、油圧発生装置20は、このエンジン150のクランクシャフト156に結合されたキャリア軸127によって油圧を発生することができる。

【0052】以上、説明した実施例の動力出力装置110によれば、リングギヤ軸126とキャリア軸127とに接続された油圧発生装置20を備えることにより、リングギヤ軸126とキャリア軸127とのいずれかが回転していれば油圧を発生することができる。即ち、エンジン150が運転されているか、車両が前進していれば、油圧発生装置20により油圧を発生することができる。しかも、リングギヤ軸126とキャリア軸127とにワンウェイクラッチ36、38を用いて1つの歯車ポンプの構成に接続するから、リングギヤ軸126とキャリア軸127とに別個に歯車ポンプを備える構成に比して装置を小型化することができる。

【0053】また、実施例の動力出力装置110では、油圧発生装置20のケーシング22をモータMG2のステータ143が取り付けられたケース147と一体として形成するから、油圧発生装置20をモータMG2と一体となって振動する大きなマスとし、振動に対する制振効果を大きくすることができる。しかも、振動の発生源であるエンジン150の入力軸としてのキャリア軸127とワンウェイクラッチ36との係合をキャリア軸127に若干のクリアランスを設けて取付固定された係合部材44を介して行なう構成としたから、エンジン150の予期しない振動や外乱等によりキャリア軸127にガタが生じて、このガタを吸収することができ、外乱等の油圧発生装置20への入力を小さくすることができる。

【0054】実施例の動力出力装置110では、リングギヤ軸126とワンウェイクラッチ38とが直接係合するものとしたが、キャリア軸127とワンウェイクラッ

チ36との係合のように、リングギヤ軸126に若干のクリアランスを設けて取付固定される係合部材とワンウェイクラッチ38とが係合するようにしてもよい。こうすれば、リングギヤ軸126に生じるガタを吸収することができ、油圧発生装置20、延いては動力出力装置110をより耐久性のあるもの及びより精度の高いものにすることができる。

【0055】実施例の動力出力装置110では、エンジン150と、プラネタリギヤ120と、モータMG1と、モータMG2とにより駆動する構成に油圧発生装置20を取り付けたが、エンジンによる駆動とモータによる駆動とが可能な如何なる動力出力装置に油圧発生装置20を取り付ける構成としてもよい。

【0056】以上、本発明の実施の形態について説明したが、本発明はこうした実施の形態に何等限定されるものではなく、例えば、実施例の動力出力装置を船舶、航空機などの交通手段や、その他各種産業機械などに搭載する構成など、本発明の要旨を逸脱しない範囲内において、種々なる形態で実施し得ることは勿論である。

【図面の簡単な説明】

【図1】本発明の一実施例である油圧発生装置20の概略構成を例示する断面図である。

【図2】図1の油圧発生装置20のB-B線断面の断面図である。

【図3】変形例である油圧発生装置50の構成を模式的に例示する模式図である。

【図4】変形例である油圧発生装置60の構成を模式的に例示する模式図である。

【図5】実施例の油圧発生装置20を構成として備える動力出力装置110の概略構成を例示する構成図である。

【図6】プラネタリギヤ120に結合された3軸の回転数とトルクの関係を示す共線図である。

【図7】プラネタリギヤ120に結合された3軸の回転数とトルクの関係を示す共線図である。

【図8】エンジン150の回転数 N_e がリングギヤ軸126の回転数 N_r より大きな場合の共線図である。

【図9】エンジン150の運転が停止されている場合の共線図である。

【図10】リングギヤ軸126の回転を停止している場合の共線図である。

【図11】従来例の歯車ポンプ200の概略構成を例示する構成図である。

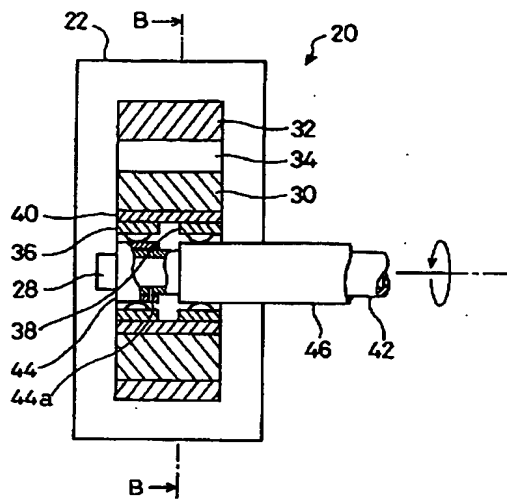
【符号の説明】

20…油圧発生装置
22…ケーシング
24…流入通路
26…流出通路
28…流出口
30…ドライブギヤ

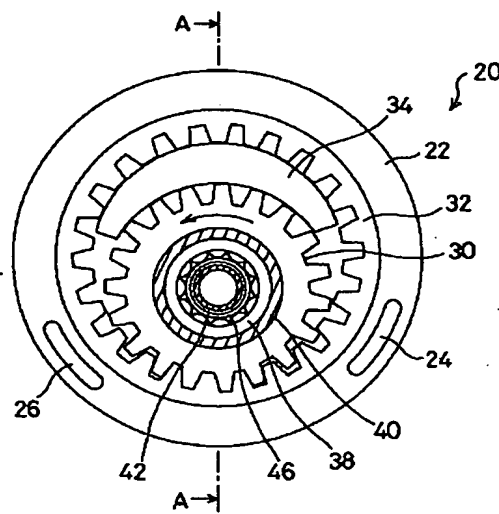
32…ドリブンギヤ
34…クレセント
36, 38…ワンウェイクラッチ
40…固定部材
42…回転軸
44…係合部材
44a…固定ピン
46…回転軸
50…油圧発生装置
52, 54…ワンウェイクラッチ
56, 58…回転軸
60…油圧発生装置
62～66…ワンウェイクラッチ
72～76…回転軸
110…動力出力装置
111…動力伝達ギヤ
112…駆動軸
114…ディファレンシャルギヤ
116, 118…駆動輪
120…プラネタリギヤ
121…サンギヤ
122…リングギヤ
123…プラネタリピニオンギヤ
124…プラネタリキャリア
125…サンギヤ軸
126…リングギヤ軸
126…リングギヤ軸
127…キャリア軸
128…動力取出ギヤ
129…チェーンベルト
132, 142…ロータ
133, 143…ステータ
134, 144…三相コイル
135, 145…永久磁石
139, 149…レゾルバ
142…ロータ
147…ケース
150…エンジン
156…クランクシャフト
180…制御装置
200…歯車ポンプ
202…ドライブギヤ
204…ドリブンギヤ
220…ケーシング
224…流入通路
226…流出通路
230…ドライブギヤ
232…ドリブンギヤ
234…クレセント
MG1…モータ

MG2…モータ

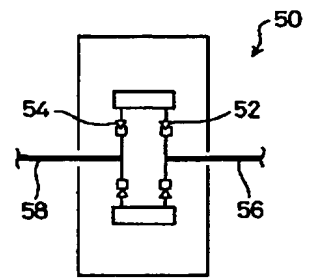
【図1】



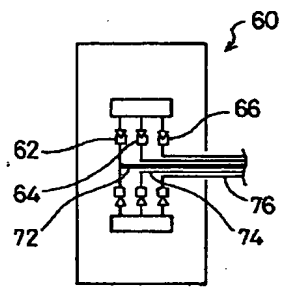
【図2】



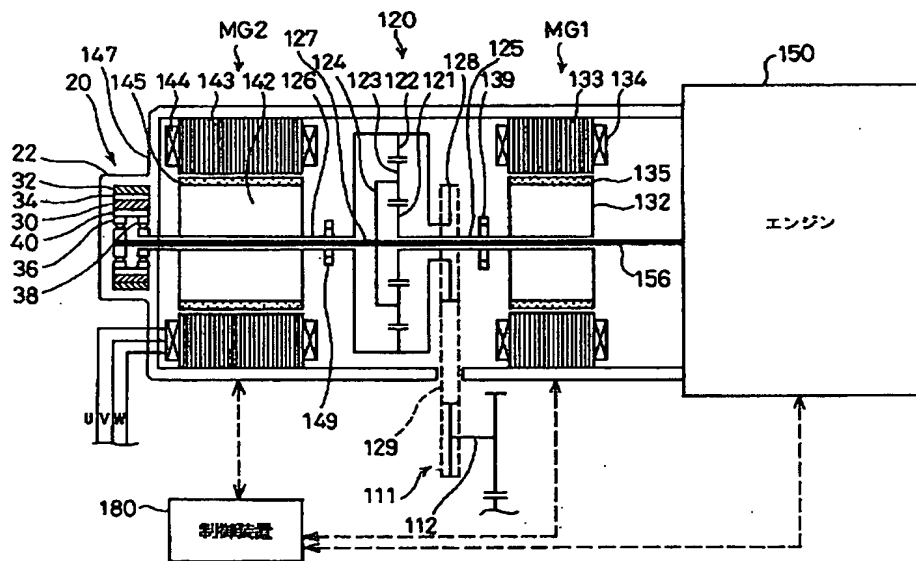
【図3】



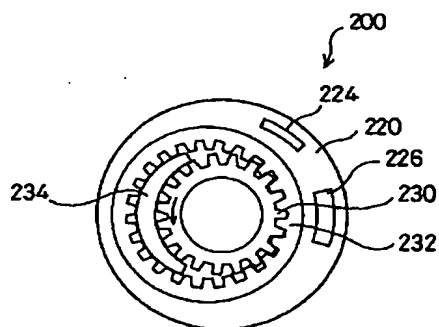
【図4】



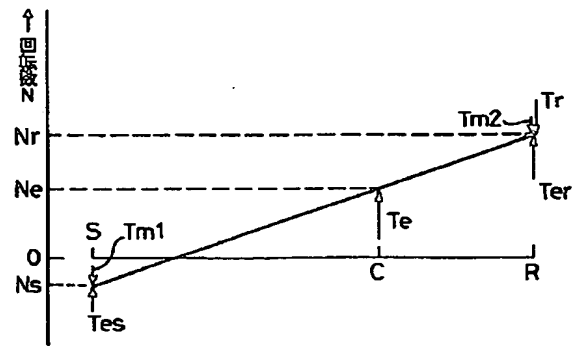
【図5】



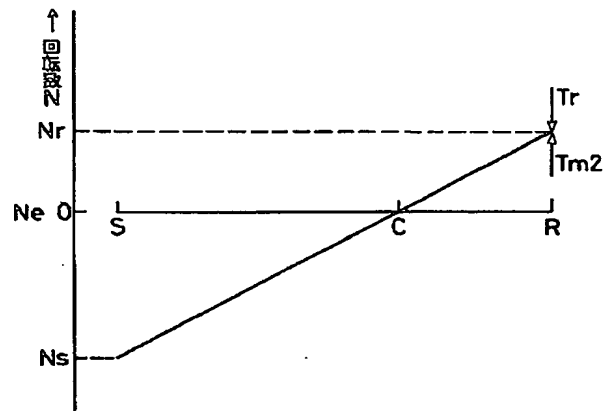
【図11】



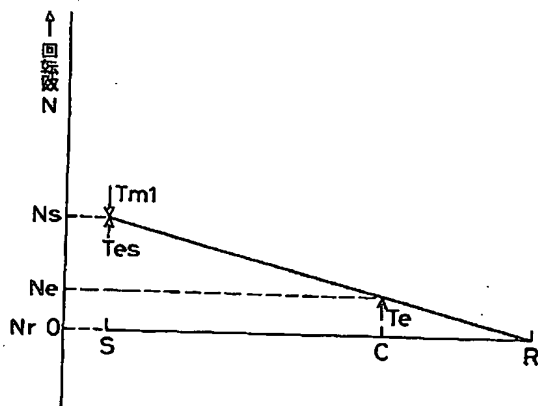
【図 7】



【図 9】



【図 10】



フロントページの続き

(72)発明者 鈴木 晴久
愛知県豊田市トヨタ町1番地 トヨタ自動車株式会社内

(72)発明者 近藤 宏一
愛知県豊田市トヨタ町1番地 トヨタ自動車株式会社内

(72)発明者 大島 啓次郎
愛知県豊田市トヨタ町1番地 トヨタ自動車株式会社内

[MENU](#)

[SEARCH](#)

[INDEX](#)

[DETAIL](#)

[JAPANESE](#)

1 / 1